Service Manual

TI-H

Ultrasonic Cleaning Units

• English •

1 General ... 3
1.1 How to use the Service Manual ... 3
1.2 Structure of the Service Manual ... 3
1.3 Service staff ... 4
1.4 Important safety warnings ... 4
1.5 Testing equipment, tools and inspection items ... 5
1.6 Important operating instructions ... 5
2 Product description ... 6
2.1 Operating elements ... 6
2.2 Unit back views ... 7
2.3 Unit bottom view ... 9
2.4 Tank view ... 10
3 Electric connections ... 11
3.1 TI-H 5 – 25 ... 11
3.2 TI-H 55 – 150 ... 11
4 Trouble shooting ... 12
4.1 Trouble shooting TI-H 5 – 20 ... 12
4.2 Trouble shooting TI-H 25 ... 14
4.3 Trouble shooting TI-H 55 – 80 ... 16
4.4 Trouble shooting TI-H 115 – 150 ... 19
5 Technical details ... 21
6 How to open the unit ... 22
7 Faulty operating elements ... 24
7.1 How to remove or replace the turning knobs ... 24
7.2 How to replace the timer ... 26
7.3 How to replace the heating switch ... 28
7.4 How to replace the control thermostate ... 30
7.5 Faulty frequency / function selector switch ... 32
8 How to replace the heating ... 34
8.1 How to replace the heating on TI-H 5 – 20 ... 34
8.2 How to replace the heating on TI-H 25 – 150 ... 36
9 How to replace the solenoid valve ... 38
10 How to replace the float switch (TI-H 25 - 150) ... 40
11 How to replace the ultrasonic generator ... 42
11.1 Characteristic features on units TI-H 55 and larger ... 45
11.2 Switch elements bottom plate TI-H 55 – 150 ... 46
11.3 Characteristic features on units TI-H 115 – 150 ... 47
12 Faulty transducer discs ... 48
13 How to replace the transducer tank ... 51

14 Putting into operation / Trial run 53
14.1 How to fill cleaning liquid 53
14.2 Cleaning media.....54
14.3 How to heat up the cleaning liquid.....54
15 Putting out of operation and disposal 54

1 General

Carefully read the Service Manual before carrying out any repair work, in particular the *important safety warnings Section 1.4*.

We reserve the right to carry out technical modifications on the unit due to advanced development.

Reprints, translations and copying of any kind, including of parts of the document, must be authorized in writing by the editor.

The copy right remains with the editor.

1.1 How to use the Service Manual

For trouble shooting please use the table of possible faults of the required type of unit (Section 4).

For information on this type of unit please see Section 2 (Product description).

Further useful information on putting into operation, trial run and standard operation can be found in the chapters *Important safety warning Section 1.6* and *Putting into operation / Trial run Section 14*.

Should you need any help from the manufacturer we will be pleased to assist. For support and manufacturer's contact address please see the last page.

1.2 Structure of the Service Manual

Safety warnings	Read and observe before repair.
Product description	Description of operating elements and unit features.
Use of unit	Instructions on the intended use of this unit type.
Table of possible faults	For every unit type there is a table of possible faults for trouble shooting (completeness not guaranteed).
Trouble shooting	Comfortable instructions on how to exchange parts and components for the individual unit types.
Putting into operation / Trial run	Instructions on initial operation, cleaning chemicals, heating of the cleaning liquid, etc.
Circuit diagrams	Annex A contains circuit diagrams for each unit type showing the individual design variants (mains voltage; ultrasonic frequency).
Spare parts lists	Annex B contains the spare parts lists, sorted by type of unit. The most frequent parts are listed; should you need other parts please contact the manufacturer.

1.3 Service staff

The present Service Manual is meant for the use by authorized service points and specialized electrical staff.

Legitimate users of the Service Manual are persons who do not need to be warned in detail against electrical hazards.

Electrical experience and knowledge of safety-relevant issues are absolutely required for the repair of ultrasonic cleaning units.

1.4 Important safety warnings

Authorized special staff

Repair and maintenance works that require the unit to be opened while connected to the mains must be carried out by authorized specialized staff only.

Mains connection

For reasons of safety, the unit must be connected to a correctly grounded socket only. The technical details on the nameplate must correspond with the available connection conditions. This applies particularly for mains voltage and connected value.

Prevention of electrical accidents

Pull the mains plug before opening the unit.

In order to prevent damage on persons and unit, the mains-connected measuring equipment and the opened ultrasonic unit must be connected through an interrupting transformer.

During operation, parts of the ultrasonic generator and of the transducer system carry high-frequency a.c. voltage.

During exchange of the transducer discs piezo-electrical effects can cause high voltages. In order to prevent damage on persons these voltages must be grounded.

Original spares

We can guarantee conformity with the valid safety norms and CE conformity only if faulty parts are replaced by original spare parts.

Exclusion of liability

The manufacturer cannot be held liable for any damages on persons, unit and workshop equipment caused by improper use or incorrect repair.

1.5 Testing equipment, tools and inspection items

These units must be operated at a grounded socket only. The units types TI-H 55 – TI-H 150 require a threephase current connection (connected value 16 A, or 25 A).

For the inspectional and repair works described in the present manual, the usual electro-mechanical tools plus the following measuring and testing equipment are required:

Multimeter For electric measuring inside the unit: e.g. resistance measuring and continuity checks.

Torque wrench For checks / repair works on the opened transducer system. The transducer system must be screwed shut with the correct torque (see Section Transducer system). A wrong torque can cause malfunctions and the break-down of the unit.

Wattmeter For the checking of the power consumption of the ultrasonic generator and the heating (can be used for units with 1 phase / N mains supply).

Variable-voltage interrupting transformer For disconnecting the unit from the mains and for the safe and controlled turning up of the mains voltage (can be used for units with 1 phase / N mains supply).

1.6 Important operating instructions

Observe before unit inspection and reoperation!

Intended use The present JOKE ultrasonic cleaning unit has been designed for the sounding of **items** and **liquids** only.

Check for damage Check unit and mains cord for transport damages. Do not operate in case of visible damage!

Placement Place the unit at a dry, stable and sufficiently ventilated workplace. Keep workplace, housing and operating elements dry and protect the unit from entering humidity!

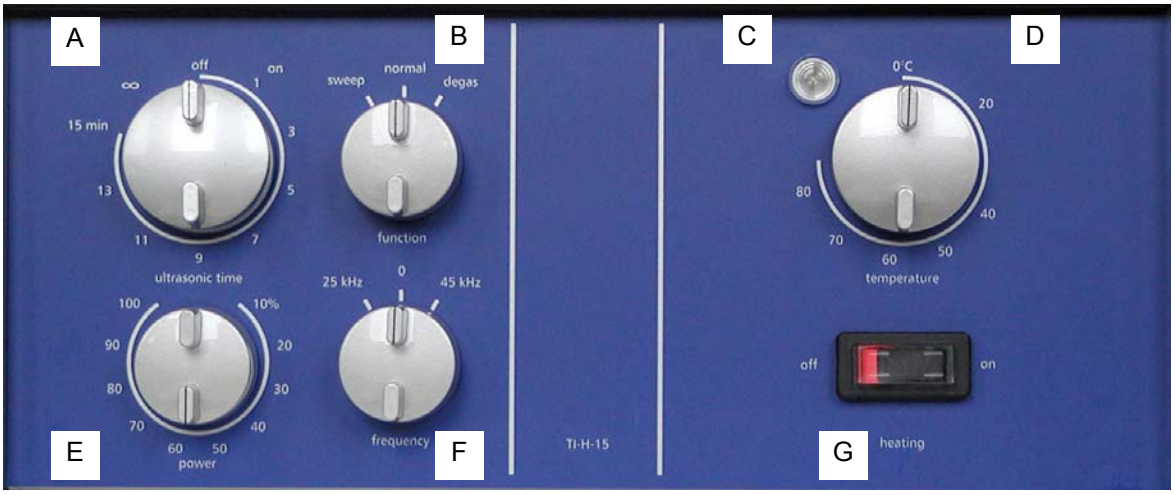
Cleaning liquid Fill the unit with a sufficient quantity of cleaning liquid before switch-on. Do not treat flammable liquids in an ultrasonic cleaning bath: risk of burning and explosion!
See also Section Cleaning chemicals.

If you have any queries please contact the manufacturer.

2 Product description

2.1 Operating elements

F



A Timer for ultrasonic operation

Setting options: 1 - 15 min for short-period operation; permanent position ∞ (manual switch-off required)

B Ultrasonic mode options (only on multi-frequency units)

Sweep – continued shifting of the sound pressure maxima, provides a more homogeneous sound field distribution in the liquid.

Degas – for the degasing of fresh cleaning liquid (single half-wave operation).

Normal – standard operation; the transducer system is operated in double half-wave mode.

C Heating control lamp

Is on during operation of the heating.

D Variable thermostate

Stepless temperature preselection of the heating.

E Power control ultrasound

Stepless control of the ultrasonic power.

F Frequency selector (only on multi-frequency units)

Preselection of the required cleaning frequency (25 / 45 kHz or 35 / 130 kHz). On units with single frequency (SF 35 kHz) this turning knob is not available.

G Heating switch

On / Off switch for heating

2.2 Unit back views

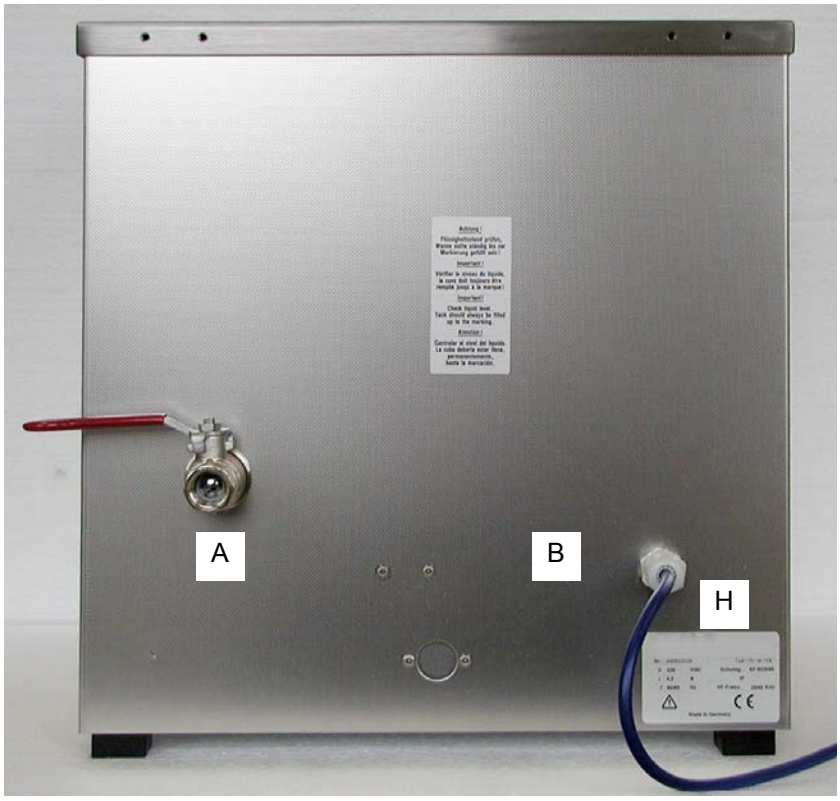


Illustration 2.1. Back view unit types TI-H 5 - 25

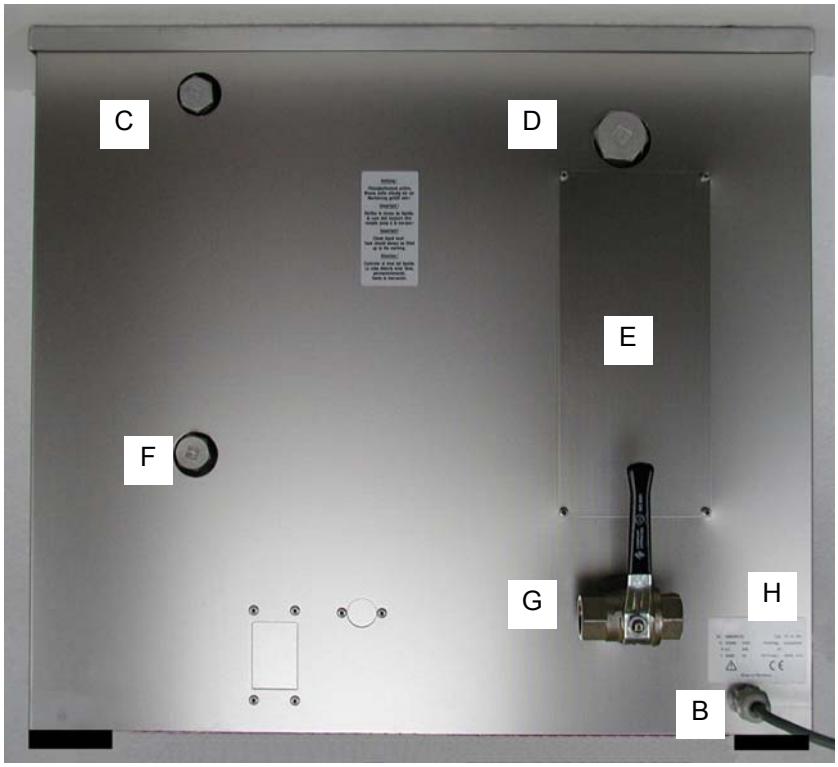


Illustration 2.2. Back view unit types TI-H 55 - 150

A 2-way ball valve ½“ (TI-H 5 – 25)

B Mains supply:
1 phase grounded socket (TI-H 5 – 25)
3 phase current (TI-H 55 – 150)

C Connection for supply surface skimming (TI-H 25 – 150)

D Connection drain to collecting basin for connection to a filter pump aggregate (TI-H 25 – 150)

E Cover plate (service opening) for heating and float switch (TI-H 25 – 150)

F Connection supply bottom scouring (TI-H 55 – 150)

G 3-way ball valve for drain / supply (TI-H 55 – 150)

H Nameplate

2.3 Unit bottom view

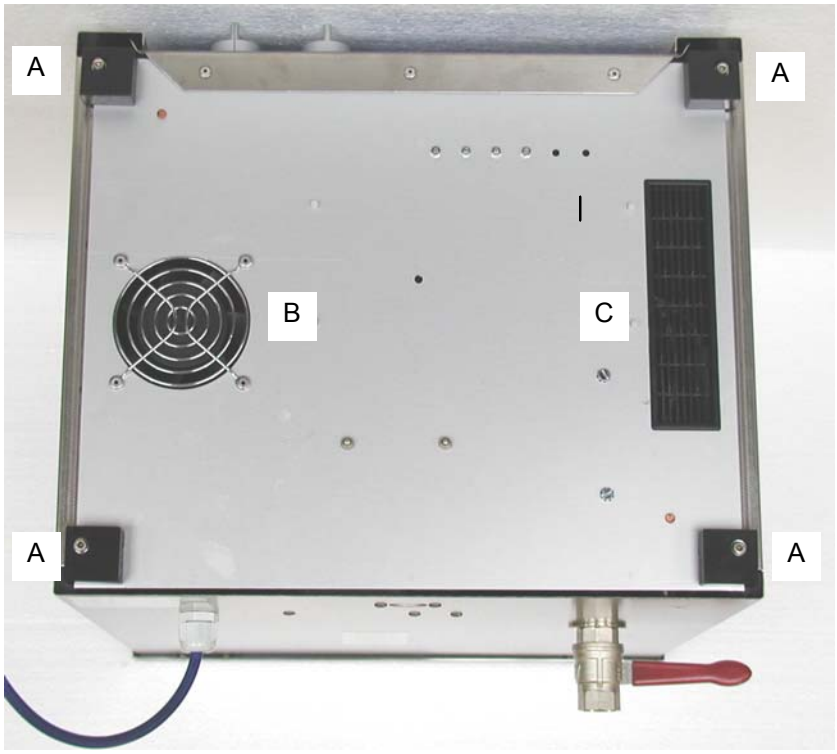


Illustration 2.3. Bottom view (here TI-H 10)

A Unit feet

B Fan

C Air discharge outlet

2.4 Tank view

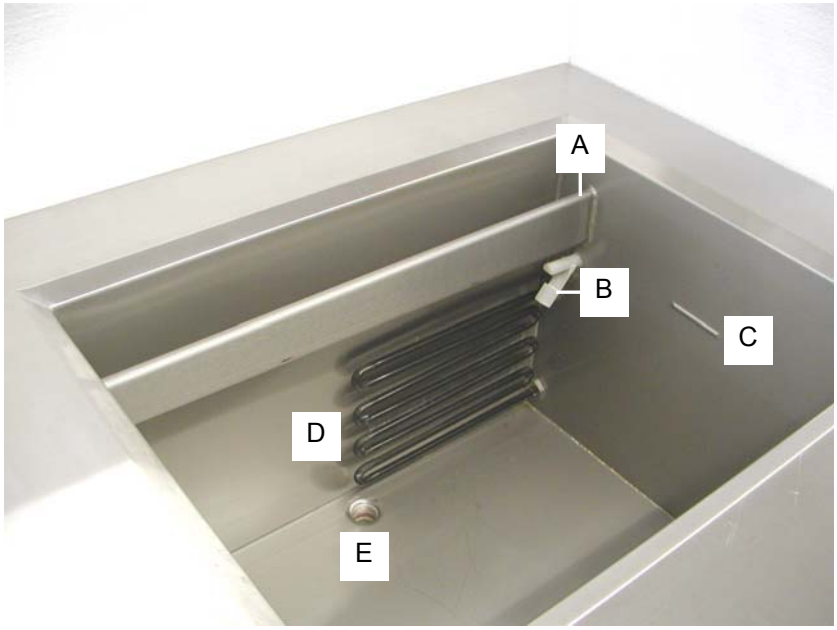


Illustration 2.4. Tank view TI-H 25 or larger (here TI-H 55)

A Overflow

B Float switch

C Filling level mark for minimum level

D Heating

E Drain

3 Electric connections

3.1 TI-H 5 – 25

Voltage variants 100 – 120V / 220 – 240V

Mains connection 1 phase / 1 N / 1 PE shockproof socket

3.2 TI-H 55 – 150

Voltage variants 200 – 208V / 380 – 400V

Mains connection 3 phase / 1 N / 1 PE earthing contact

Mains cable grouping cable no. 1.....phase L1

cable no. 2.....phase L2

cable no. 3.....phase L3

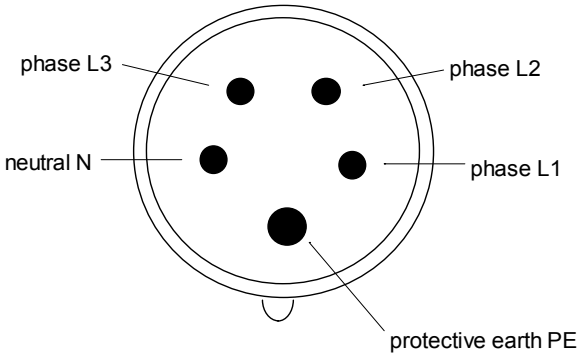
cable no. 4.....neutral

cable green-yellow....PE

voltages between the cables: 400V

voltage between cables and neutral: 230V

Grouping CEKON mains plug The CEKON mains plug grouping according to the standard:



4 Trouble shooting

4.1 Trouble shooting TI-H 5 – 20

Malfunction	1. Check: Signal lamp heating	2. Check: Fuse printed board	Possible causes	Remedy
No ultrasound (both frequencies without function) Heating OK	OK	OK	a. Timer b. Faulty generator c. Scorching / short circuit in transducer system	a. Replace component b. Replace printed board c. Open/check transducer system
No ultrasound (one frequency OK, one frequency without function) Heating OK	OK	OK	a. Faulty generator b. Faulty PXE ring(s) c. Faulty frequency switch-over relay (K1) d. Faulty frequency selector switch (S5) e. Broken frequency switch-over cable	a. Replace printed board b. Open/check transducer system c. Replace component d. Replace component e. Repair
No ultrasound (both frequencies without function) Heating OK	OK	FAULTY	a. Short circuit in generator / faulty generator	a. Replace printed board
Ultrasound not sufficient (with potentiometer at 100%) Heating OK	OK	OK	a. Scorching / short circuit in transducer system b. Faulty PXE ring(s) c. Printed board adjustment not within tolerance (e.g. after replacement) d. Faulty output potentiometer (P1) e. Bottom of transducer tank heavily eroded f. Wrong operation (unsuitable or no cleaning medium in water)	a. Open/check transducer system b. Replace component(s) c. Return unit to JOKE for inspection d. Replace component e. Replace transducer tank f. See Operating Instructions

Malfunction	1. Check: Signal lamp heating	2. Check: Fuse printed board	Possible causes	Remedy
Unit dead (no ultrasound, no heating)	OFF	OK	a. No power supply from the mains (external) b. Broken mains cable c. Faulty interference elimination d. Broken cable / power break-down in unit	a. Check mains power supply b. Replace component c. Replace component d. Find / repair fault
Fuse automatic (building) released; (no ultrasound; no heating)	OFF	OK	a. Short circuit heating b. Water in heating switch c. Liquid inside unit	a. Disconnect heating cable in unit, check unit again: if short circuit does not occur again, the heating is faulty: find and replace faulty heating b. Replace component c. Replace faulty components
No heating (ultrasound OK)	OFF	OK	a. Faulty heating switch b. Faulty control thermostate (no „click“; use ohmmeter)	a. Replace component b. Replace component

4.2 Trouble shooting TI-H 25

Malfunction	1. Check: Signal lamp heating	2. Check: Fuse printed board	Possible causes	Remedy
No ultrasound (both frequencies without function) Heating OK	OK	OK	a. Timer b. Faulty generator c. Scorching / short circuit in transducer system	a. Replace component b. Replace printed board c. Open/check transducer system
No ultrasound (one frequency OK, one frequency without function) Heating OK	OK	OK	a. Faulty generator b. Faulty PXE ring(s) c. Faulty frequency switch-over relay (K1) d. Faulty frequency selector switch (S5) e. Broken frequency switch-over cable	a. Replace printed board b. Open/check transducer system c. Replace component(s) d. Replace component e. Repair
No ultrasound (both frequencies without function) Heating OK	OK	FAULTY	a. Short circuit in generator / faulty generator	a. Replace printed board
Ultrasound not sufficient (with potentiometer at 100%) Heating OK	OK	OK	a. Scorching / short circuit in transducer system b. Faulty PXE ring(s) c. Printed board adjustment not within tolerance (e.g. after replacement) d. Faulty output potentiometer (P1) e. Bottom of transducer tank heavily eroded f. Wrong operation (unsuitable or no cleaning medium in water)	a. Open/check transducer system b. Replace component(s) c. Return unit to JOKE for inspection d. Replace component e. Replace transducer tank f. See Operating Instructions

Malfunction	1. Check: Signal lamp heating	2. Check: Fuse printed board	Possible causes	Remedy
Unit dead (no ultrasound; no heating)	OFF	OK	a. Filling level too low (below float switch) b. Faulty float switch c. No power supply from the mains (external) d. Broken mains cable e. Faulty interference elimination f. Broken cable / power break-down in unit	a. Add liquid above level of float switch b. Replace component c. Check mains power supply d. Replace component e. Replace component f. Find / repair fault
Fuse automatic (building) released; (no ultrasound; no heating)	OFF	OK	a. Short circuit heating b. Water in heating switch c. Liquid inside unit	a. Disconnect heating cable in unit, check unit again: if short circuit does not occur again, the heating is faulty: find and replace faulty heating b. Replace component c. Replace faulty components
No heating (ultrasound OK)	OFF	OK	a. Faulty heating switch b. Faulty control thermostate (no „click“; use ohmmeter)	a. Replace component b. Replace component

4.3 Trouble shooting TI-H 55 – 80

Malfunction	1. Check: Signal lamp heating	2. Check: Fuse autom. (F2) bottom plate	3. Check: Fuse printed board	Possible causes	Remedy
No ultrasound (both frequencies without function) Heating OK	OK	NOT RE-LEASED	OK	a. Timer b. Faulty generator c. Scorching / short circuit in transducer system d. Faulty interference elimination	a. Replace component b. Replace printed board c. Open/check transducer system d. Check passage; replace component
No ultrasound (both frequencies without function) Heating OK	OK	RE-LEASED	OK or FAULTY	a. Faulty generator	a. Replace printed board
No ultrasound (one frequency OK, one frequency without function) Heating OK	OK	NOT RE-LEASED	OK	a. Faulty generator b. Faulty PXE ring(s) c. Faulty frequency switch-over relay (K1) d. Faulty frequency selector switch (S5) e. Broken frequency switch-over cable	a. Replace printed board b. Open/check transducer system c. Replace component d. Replace component e. Repair
No ultrasound (both frequencies without function) Heating OK	OK	NOT RE-LEASED	FAULTY	a. Short circuit in generator / faulty generator	a. Replace printed board

Malfunction	1. Check: Signal lamp heating	2. Check: Fuse autom. (F2) bottom plate	3. Check: Fuse printed board	Possible causes	Remedy
Ultrasound not sufficient (with potentiometer at 100%) Heating OK	OK	NOT RE-LEASED	OK	a. Faulty PXE ring(s) b. Printed board adjustment not within tolerance (e.g. after replacement) c. Faulty output potentiometer (P1) d. Faulty generator e. Bottom of transducer tank heavily eroded f. Wrong or no cleaning medium in water	a. Open/check transducer system b. Return unit to JOKE for inspection c. Replace component d. Replace printed board e. Replace transducer tank f. See Operating Instructions
Unit dead (no ultrasound / no heating)	OFF	NOT RE-LEASED	OK	a. Filling level too low (below float switch) b. Faulty float switch c. No mains power supply (external) d. Broken mains cable e. Faulty interference elimination f. Broken cable / power break-down in unit	a. Add liquid above level of float switch b. Replace component c. Check mains power supply d. Replace component e. Replace component f. Find / repair fault
Fuse automatic (building) released; no heating; no ultrasound	OFF	NOT RE-LEASED	OK	a. Short circuit in heating b. Water in heating switch c. Liquid inside unit	a. Disconnect heating cable in unit, check unit again: if short circuit does not occur again, the heating is faulty: find and replace faulty heating b. Replace component c. Replace faulty components

Malfunction	1. Check: Signal lamp heating	2. Check: Fuse autom. (F2) bottom plate	3. Check: Fuse printed board	Possible causes	Remedy
No heating (ultrasound OK)	OFF	NOT RE-LEASED	OK	a. Faulty heating switch b. Faulty control thermostate (no „click“; use ohmmeter)	a. Replace component b. Replace component

4.4 Trouble shooting TI-H 115 – 150

Malfunction	1. Check: Signal lamp heating	2. Check: Fuse autom. (F2) bottom plate	3. Check: Fuse printed board	Possible causes	Remedy
No ultrasound (both frequencies without function) Heating OK	OK	NOT RE-LEASED	OK	a. Timer b. Faulty generator c. Scorching / short circuit in transducer system d. Faulty interface (A1) e. Power supply interface interrupted f. Control cable interface/gene-rators interrupted g. Faulty interference elimination	a. Replace component b. Replace printed board c. Open/check transducer system d. Replace component e. Find cause / repair f. Find cause / repair g. Check passage; if necessary replace component
No ultrasound (both frequencies without function) Heating OK	OK	RE-LEASED	OK or FAULTY	a. Faulty generator	a. Replace printed board
No ultrasound (one frequency OK, one frequency without function) Heating OK	OK	NOT RE-LEASED	OK	a. Faulty generator b. Torn PXE ring(s) c. Faulty frequency switch-over relay (K1) d. Faulty frequency selector switch (S5) e. Broken frequency switch-over cable	a. Replace printed board b. Open/check transducer system c. Replace component d. Replace component e. Repair
No ultrasound (both frequencies without function) Heating OK	OK	NOT RE-LEASED	FAULTY	a. Short circuit in generator / faulty generator	a. Replace printed board

Malfunction	1. Check: Signal lamp heating	2. Check: Fuse autom. (F2) bottom plate	3. Check: Fuse printed board	Possible causes	Remedy
Ultrasound not sufficient (with potentiometer at 100%) Heating OK	OK	NOT RE-LEASED	OK	a. Faulty PXE ring b. Printed board adjustment not within tolerance (e.g. after replacement) c. Faulty output potentiometer (P1) d. Bottom of transducer tank heavily eroded e. Wrong operation (unsuitable or no cleaning medium in water)	a. Open/check transducer system b. Return unit to JOKE for inspection c. Replace component d. Replace transducer tank e. See Operating Instructions
Unit dead (no ultrasound / no heating)	OFF	NOT RE-LEASED	OK	a. Filling level too low (below float switch) b. Faulty float switch c. No mains power supply (external) d. Broken mains cable e. Faulty interference elimination f. Broken cable / power break-down in unit	a. Add liquid above level of flaot switch b. Replace component c. Check mains power supply d. Replace component e. Replace component f. Find / repair fault
Fuse automatic (building) released; No heating; No ultrasound	OFF	NOT RE-LEASED	OK	a. Short circuit in heating b. Water in heating switch c. Liquid inside unit	a. Disconnect heating cable in unit, check unit again: if short circuit does not occur again, the heating is faulty: find and replace faulty heating b. Replace component c. Find and replace faulty components
No heating (Ultrasound OK)	OFF	NOT RE-LEASED	OK	a. Faulty heating switch b. Faulty control thermostate (no „click“; use ohmmeter)	a. Replace component b. Replace component

5 Technical details

	Mains voltage (Vac) at 50 / 60 Hz	Mains connection	Ultrasonic power effective (W)	Power consumption heating (W)	Weight approx. (kg)
TI-H 5	100-120 / 220-240	1 phase earthing contact	100	400	11
TI-H 10	100-120 / 220-240	1 phase earthing contact	200	800	15
TI-H 15	100-120 / 220-240	1 phase earthing contact	200	1000	17
TI-H 20	100-120 / 220-240	1 phase earthing contact	250	1400	19
TI-H 25	100-120 / 220-240	3 phases 1 neutral 1 PE	300	1000	23
TI-H 55	200 / 400	3 phases 1 neutral 1 PE	600	3000	50
TI-H 80	200 / 400	3 phases 1 neutral 1 PE	900	4000	70
TI-H 115	200 / 400	3 phases 1 neutral 1 PE	1400	6000	120
TI-H 150	200 / 400	3 phases 1 neutral 1 PE	1600	6000	150

6 How to open the unit

CAUTION

Live parts inside unit!

Risk of electrocution.

Always pull the mains plug before opening the unit.

For checks requiring the unit to be connected use a mains interrupting transformer.

How to remove the bottom plate

1. Place the unit onto the workplace upside down.
2. Loosen the hexagon socket screw (*Illustration 2.3.*) in the unit feet.
3. Carefully lift out the bottom plate with the front plate (*Illustration 5.1.*) and place upside down onto the unit (*Illustration 5.2.*).

Most components and parts can now be checked and/or replaced without loosening the cables.

How to mount the bottom plate

1. Follow the above steps in reverse order.
2. When closing the bottom plate ensure that all electric contacts are correctly plugged and no cables are pinched.

Illustration 5.1. How to open the unit: loosen bottom plate and lift it up (here TI-H 10).

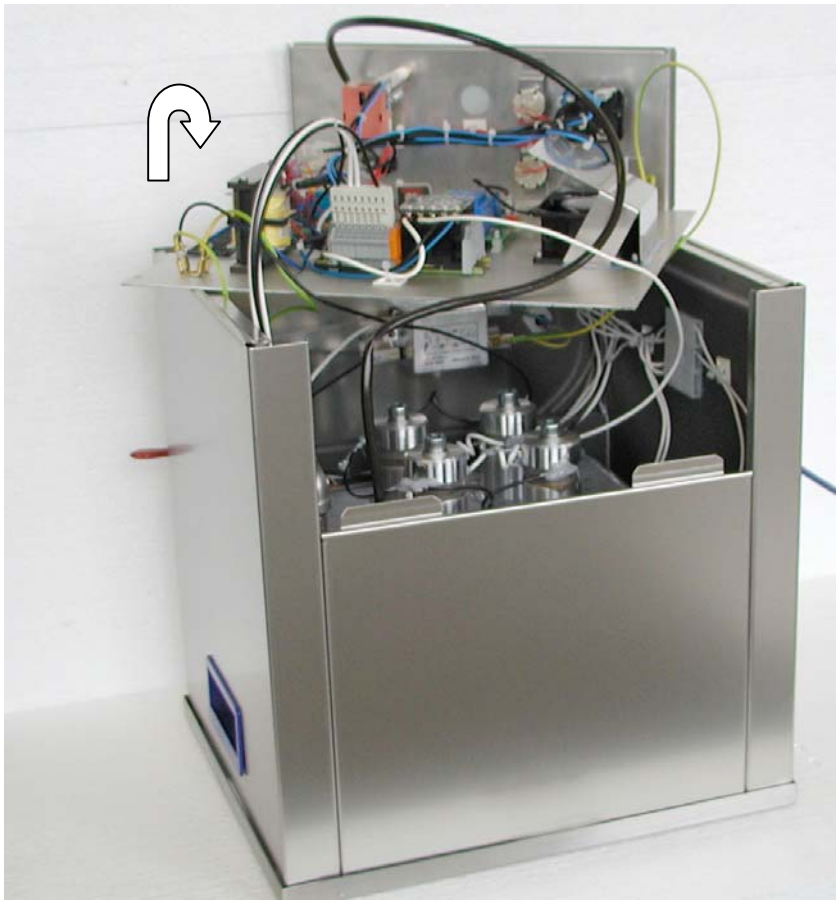


Illustration 5.2. Opened unit, bottom plate placed on housing

7 Faulty operating elements

7.1 How to remove or replace the turning knobs

The turning knobs consist of the round knob shell (silver) and the knob base. The two parts of the turning knob are connected by a „snap-in“ device.

Order No.

Turning knob timer / heating control:	200 000 0948
Turning knob frequency / function / power:	200 000 0947
Turning knob base timer:	200 000 1031
Turning knob base timer / heating control:	200 000 1136
Spring chuck frequency / function / power	200 000 0951

To replace the turning knob when damaged or to remove the knob to allow replacement of a faulty operating element, proceed as follows:

Remove the turning knob

1. Push the turning knob shell approx. 4 – 5 mm to the side (*Illustration 7.1/7.*2) and tip it off.
2. Pull the black knob base from the switch axle (*Illustration 7.3.*) (if an operating element must be replaced).

Mount the turning knob

3. Push the black knob base onto the switch axle.
4. Position the turning knob shell onto the base (use the centering guidance and let it catch.

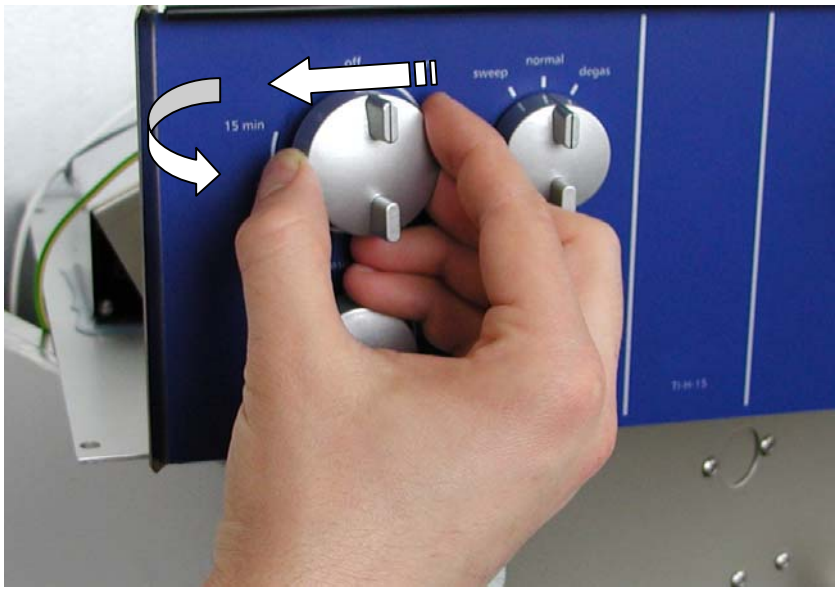


Illustration 7.1.Push the turning knob to the side ....

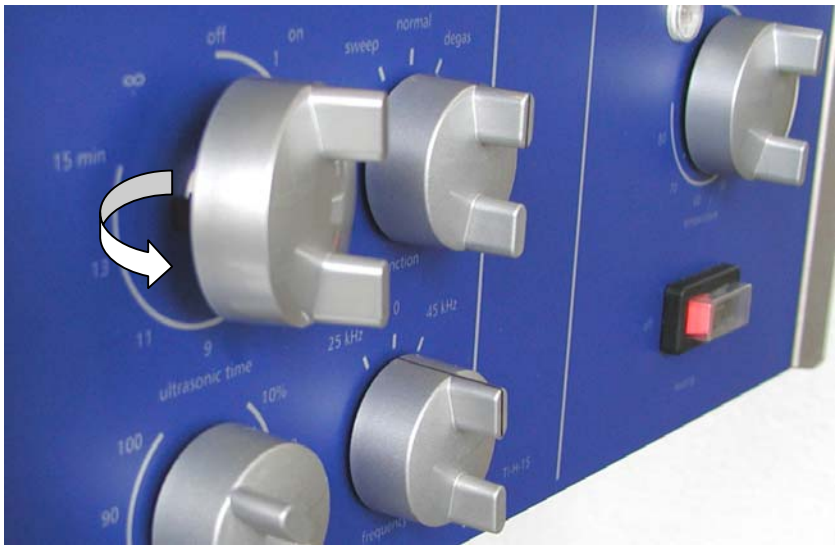


Illustration 7.2. ... and tip it off.

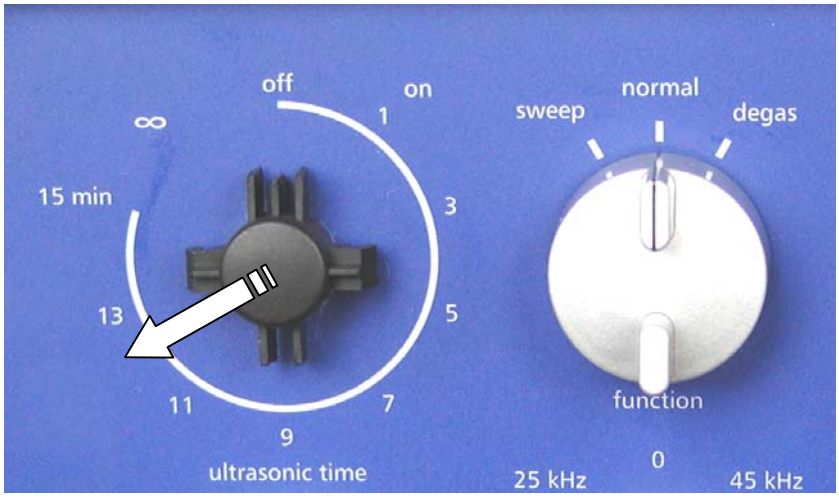


Illustration 7.3. Pull the turning knob base off.

7.2 How to replace the timer

If the timer does no longer run down during timer operation or if it cannot be turned into permanent operation position it is probably broken.

Order No. (for all mains voltages) 200 000 5114.

To replace the part it is necessary to open the bottem plate. Proceed as follows:

How to proceed

1. Open the unit as described in *Section 6*.
2. Remove the turning knob as described in *Section 7.1*.
3. Loosen the plug-in contacts of the 4 electric cables at the timer (mark the grouping).
4. Cut the foil around the fastening screws at the front.
5. Loosen the two fastening screws at the front and remove the timer.
6. Mount the new timer following the steps in reverse order.
7. Plug in the contacts at the timer.

   CAUTION! RISK OF SHORT CIRCUIT when the cables are not or not correctly plugged in (wrong polarization)!

   Ensure that the wiring is correct:
   Mains input to the timer contacts **1A** and **2A**; mains output contacts **1** and **2**.
   Observe the relevant flow sheet in *Annex A.*
8. Mount the turning knob as described in *Section 7.1*.
9. Mount the bottom plate; close the unit. Ensure that all plug-in contacts are grouped correctly and that no cables are pinched.

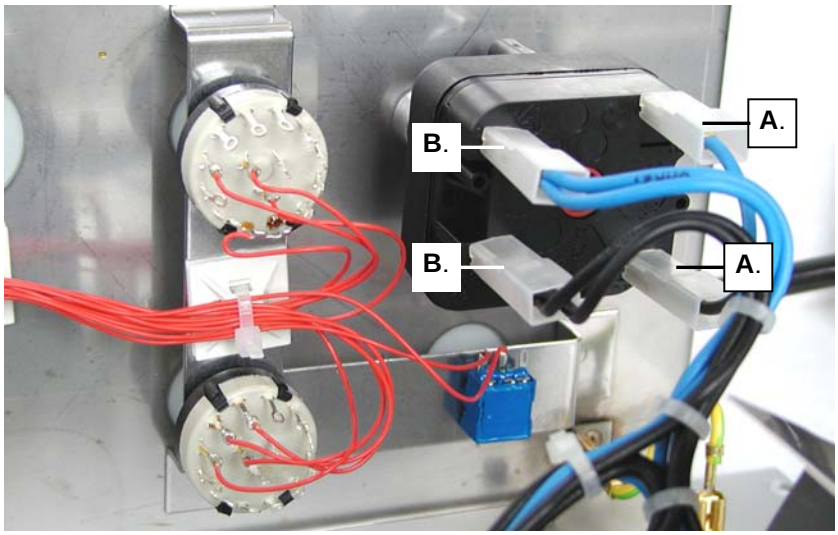


Illustration 7.4. Position and contacts timer

A Connection input (mains voltage)

B Connection output a.c. voltage to generator and fan

7.3 How to replace the heating switch

The heating switch is a single-pole switch element.
The heating switch in the units made in April 2003 or later is additionally protected against entering humidity with a rubber piece (IP 65).

Cause of malfunction The part can be destroyed by entering humidity, mechanical stress or damaging. Replace the part as soon as these damages are visible or if an electrical fault occurs.

Order No. (for all mains voltages) 200 000 0973

How to proceed There are two ways to replace the heating switch:
A: Remove the switch from inside, for this the unit must be opened. Proceed as follows:

A mistaking of the two supply cables has no consequence on the functioning of the unit.

1. Open the unit as described in *Section 6*.
2. Loosen the two electric connections at the heating switch contacts. (*Illustration 7.5.A*).
3. The heating switch is fastened to the front plate by a snap-in device:
   Pull the switch off the plate by pressing the plastic clasp together.
4. Fix the new heating switch onto the plate.
   CAUTION: Ensure that the switch is positioned correctly; observe the marking on the switch *(Illustration 7.6.B)*.
   Press the switch into the front plate (clicking sound must be audible).
5. Connect the two electric cables with the heating switch (*Illustration 7.5.A*). Polarization of the supply cables is not required.
6. Make sure that no cable is loose or pinched and close the housing.

B: (without opening of the housing): Use a suitable tool (e.g. screw driver, knife) to lever the heating switch out of the front and proceed as described in steps 2., 4. and 5.

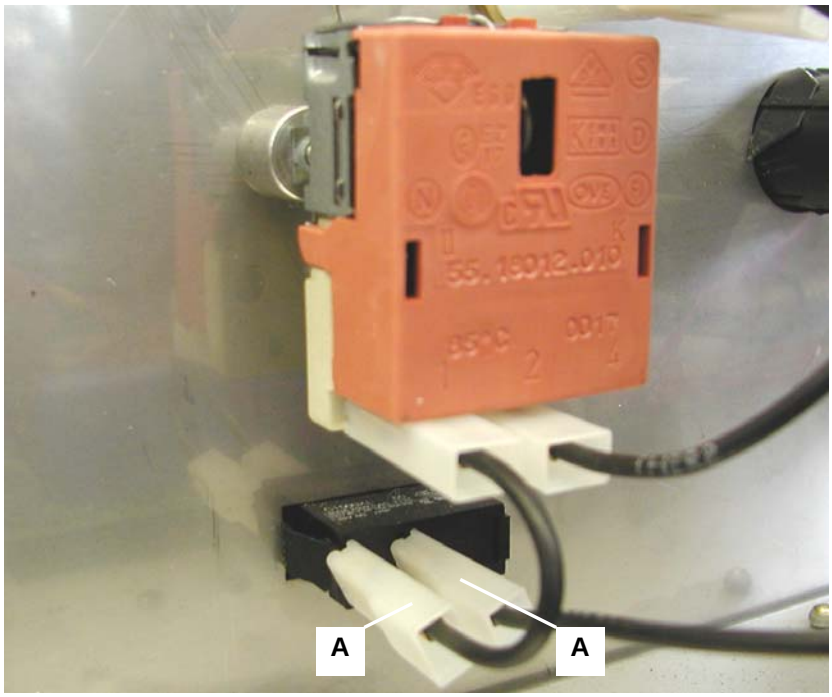


Illustration 7.5. Position and connections heating switch

A a.c. voltage connections (input / output) heating switch.
It is not required to observe the polarization.

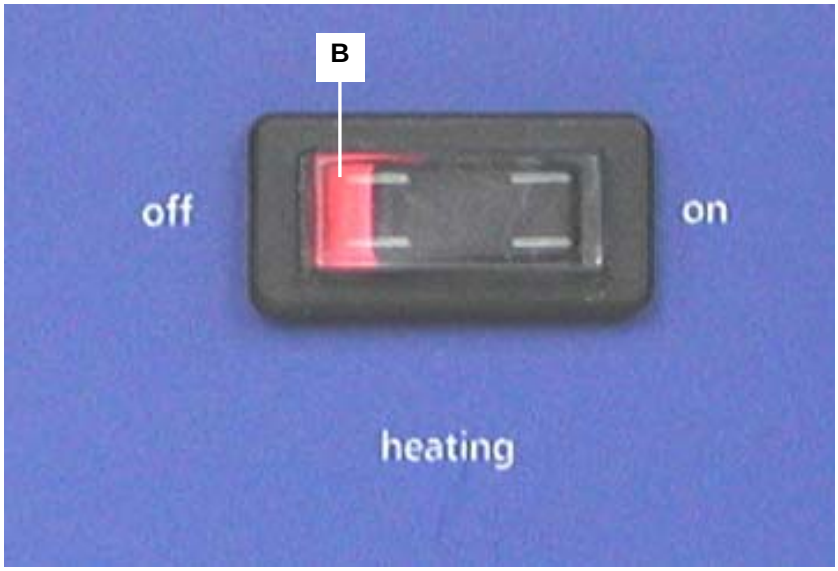


Illustration 7.6. Position heating switch

B Make sure that the switch is positioned correctly. The red marking points to the “off” position.

7.4 How to replace the control thermostate

The correct functioning of the control thermostate can be checked easily: Turn the knob; around the ambience temperature of the capillary probe (bath / tank temperature) a clicking sound in the component (break-over point) is audible.

Order No. (for all mains voltages) 200 000 5127

To replace the part it is necessary to open the bottem plate. Proceed as follows:

How to proceed

1. Open the unit as described in *Section 6*.
2. Remove the turning knob as described in *Section 7.1*.
3. Loosen the plug-in contacts of the electric supply cables from the control thermostate (*Illustration 7.7.A*).
4. Cut the foil around the fastening screws at the front.
5. Loosen the two fastening screws at the front and remove the control thermostate.
6. Pull the temperature probe out of the metal socket (on the tank outside wall). If necessary cut the silicon sealing.
7. Insert the new thermostate into the front plate with the connection contacts pointing to the bottom plate; position the distance sleeves. Then fix the fastening screws.
8. Take the insulating tube of the capillary duct from the faulty thermostate. Press the temperature probe into the metal socket and seal with silicon.
9. Reconnect the electric supply cables to the thermostate (*Illustration 7.7.A*), polarization is not relevant. Make sure that no cable is loose or pinched and close the housing.

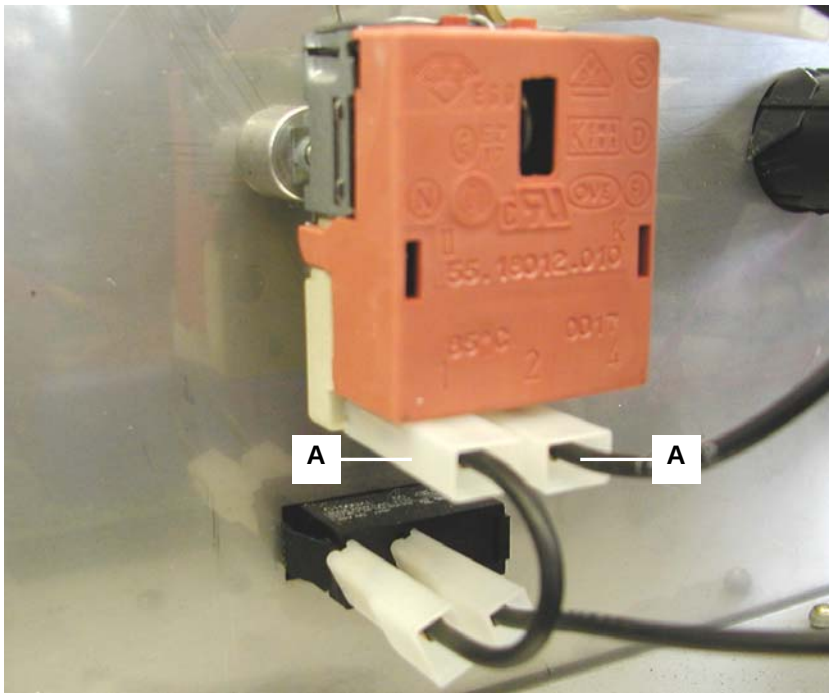


Illustration 7.7. Position and connections control thermostate

A a.c. voltage connections (input / output) control thermostate. It is not required to observe the polarization.

7.5 Faulty frequency / function selector switch

In case of a malfunction of one of the two selector switches a mechanical fault, a broken supply cable or a fault in the ultrasonic generator can be the cause (see also Section 4, Trouble shooting).

A faulty power control can destroy the ultrasonic generator. Therefore, do not operate the unit with faulty / damaged power control.

Order No. (for the relevant mains voltage)

Frequency / function selector switch:	200 000 0913
Potentiometer ultrasonic power control:	200 000 5114

To replace the part it is necessary to open the bottom plate. Proceed as follows:

How to proceed

1. Open the unit as described in *Section 6*.
2. Remove the turning knob as described in *Section 7.1*.
3. Mark the supply cables according to their connection details on the switch.
4. Unsolder the supply cables.
5. Loosen the nut with a suitable tool; remove the part.
6. Mount the new ready-made switch following the steps in reverse order and carefully solder the supply cables according to their marking.
7. Mount the turning knob.
8. Reassemble the unit; make sure that no cable is loose or pinched and close the unit.

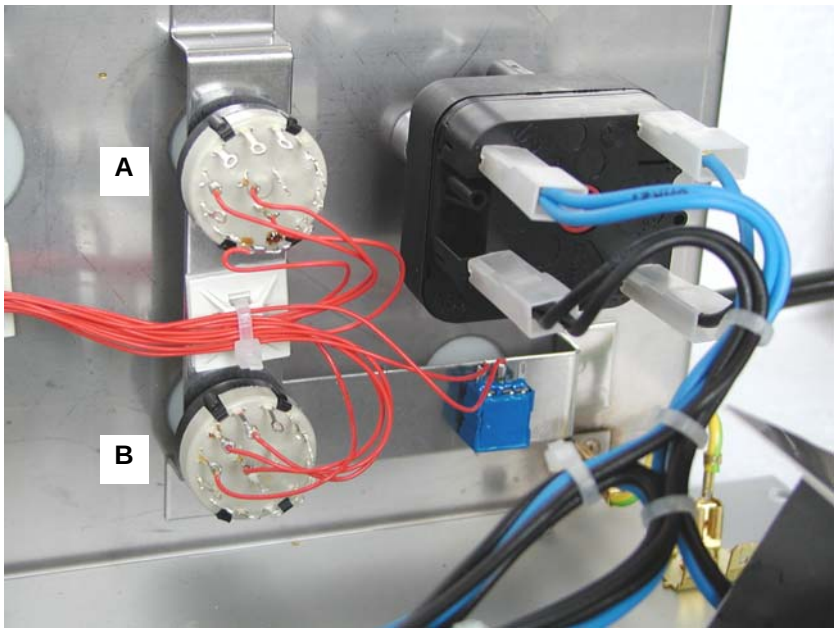


Illustration 7.8. Position and connections ultrasonic function selector and frequency selector switch

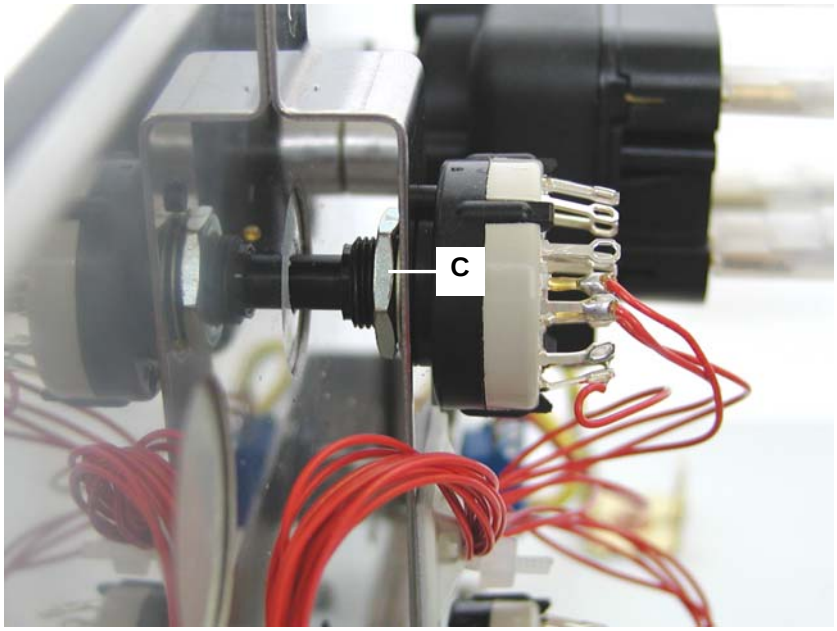


Illustration 7.9. Component fixation

A Ultrasonic function selector switch

B Frequency selector switch

C Switch fastening screw

8 How to replace the heating

8.1 How to replace the heating on TI-H 5 – 20

The PTC heating element is safe to run dry. If the liquid level in the tank is reduced below the heating position, the element automatically limits the power consumption and so reduces the released heating energy.

Cause for break-down

The only possible cause for a break-down of this type of heating is a short circuit in the component (humidity, etc.) In this case the fault current breaker and/or the fuse automatic of the used supply socket is released.

Order No.

230 V version 200 000 7157

115 V version 200 000 7216

On most unit types the heating element can be replaced without removal of the tank. Poceed as follows:

How to proceed

1. Open the unit as described in *Section* 6.
2. Find the faulty heating element (in case of more than one), e.g. by separately connecting the individual heating elements.
3. Loosen the connection cables of the faulty heating element.
4. Cut the silicon sealing (which prevents a displacement of the heating) between the heating profile and the heating rail, *see Illustration 8.1.C*.
5. Take the aluminum profile of the heating horizontally out of the guiding rails, e.g. with a fork wrench, a wooden block etc. and a plastic hammer.
6. Use a file to round off the edges of the aluminum profile which go into the guiding rails (B) first.
7. Set the heating element on the guiding rails and position it carefully.
8. Secure the heating against displacing with silicon.

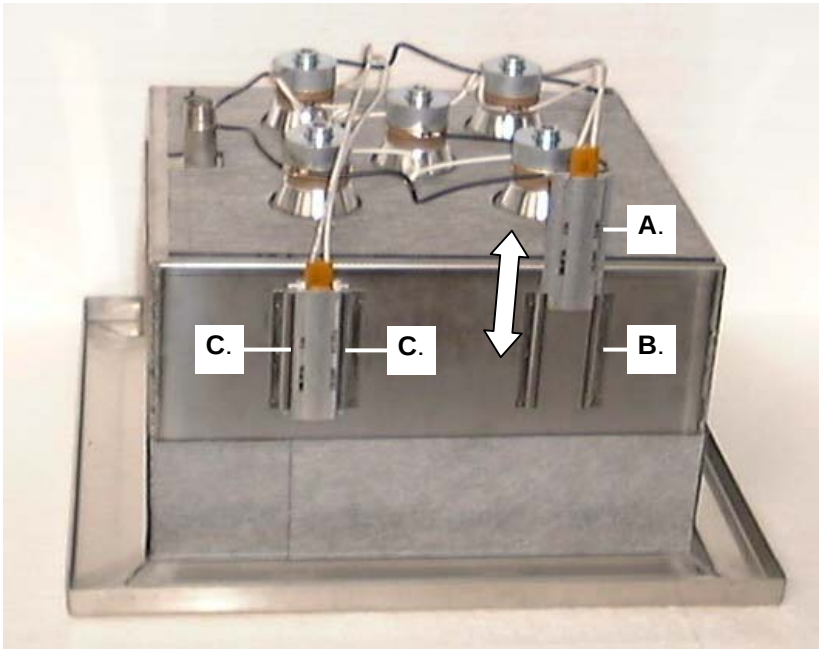


Illustration 8.1. Replacement of heating element with removed tank

Illustration 8.2. Inserting the new PTC heating

A PTC heating

B Guiding rails

C Section of silicon fixation

8.2 How to replace the heating on TI-H 25 – 150

This type of unit is fitted with tube heating elements (direct heating). The heating power is perfectly transmitted into the cleaning liquid. Depending on the size of the tank the unit is equipped with one or more heating elements.

Cause for break-down

The tube heating element can be damaged by aggressive cleaning media, dry running caused by a faulty level switch or mechanical force.

Order No.

See spare parts list Annex B, choose the part depending on type of unit and voltage.

Check

Check the functioning of the heating by measuring the mains voltage at the electric connections of the element (e.g. with a voltage tester or a multimeter).
If there is no mains voltage check the electric drive of the heating (see flow diagram in the annex).

If the mains voltage at the contacts is correct the tube heating element is probably faulty.

Also check the fuse automatics F1 and F3 on the bottom plate.

How to proceed

To replace the heating follow the instructions below:

1. Unscrew the housing cover sheet (back of the unit).
2. Pull off the plug-in contacts (*see Illustration 8.3.*A) of the voltage supply.
3. Loosen the two fastening screws (*see Illustration 8.3.*B) with a 22 mm fork wrench.
4. Pull of the tube heating into the tank (*see Illustration 8.4.C*).
5. Position and screw the new heating (with two new O ring sealings) into the heating supports in the tank wall. Ensure that it is positioned correctly to avoid leaks in the tank.
6. Reconnect the electric cables. Polarization of the two cables is not required.
7. Put back the housing cover sheet.

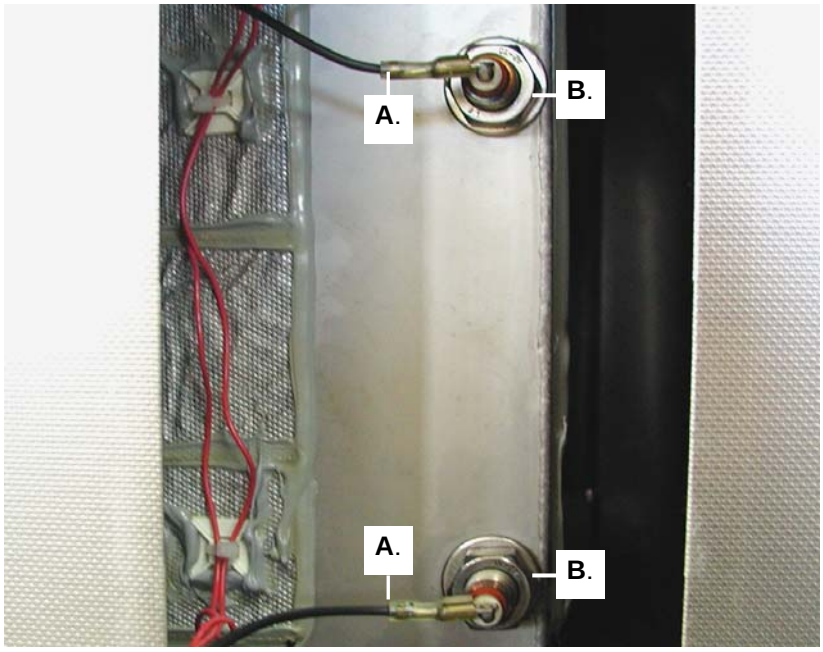


Illustration 8.3. View heating connections with opened cover sheet

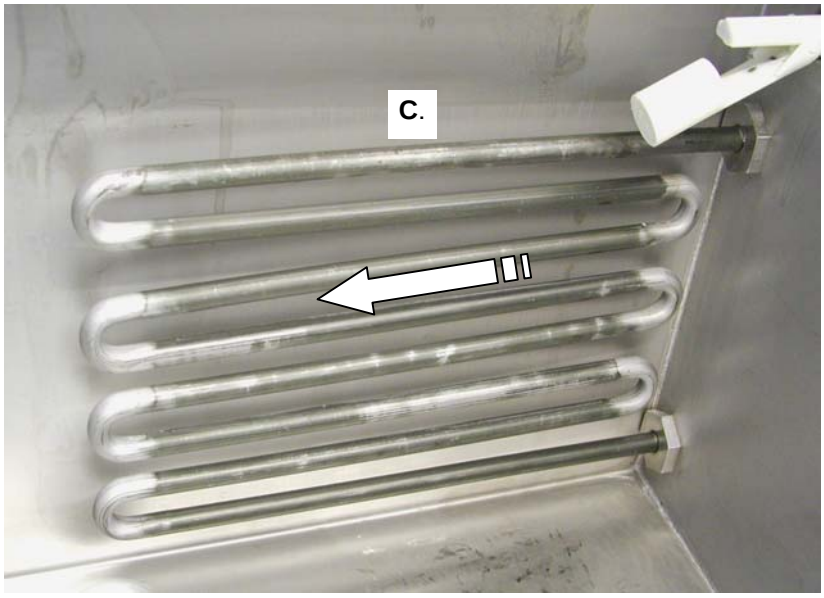


Illustration 8.4. View mounted heating (tank inside)

9 How to replace the solenoid valve

Over a certain period the unit types TI-H 5 – 25 were equipped with solenoid valves.

If a solenoid valve starts leaking replace it with a mechanical ball valve.

Cause for break-down

Dirt particles in the drain system can block the closing mechanism of the solenoid valve. Correct functioning is no longer possible.

This problem cannot occur with standard mechanical ball valves.

Order No.

2-way ball valve ½“ version: 200 000 6039

How to proceed

To replace the faulty component proceed as follows:

1. Pull the electric solenoid valve connection from the housing by turning the round plug-in connection (*see Illustration 9.1*.).
2. Loosen the screw of the connection plug at the valve coil and pull off the plug (*see Illustration 9.1*.).
3. Turn the solenoid valve counter-clockwise from the threaded duct (*see Illustration 9.2*.).
4. Prepare the external thread of the drain duct with Teflon tape or another suitable sealing.
5. Screw the mechanical ball valve onto the prepared threaded duct.
   Note: The drain duct in the unit is fixed by a locknut (*see Illustration 9.3*.); therefore, it can occur that the handle does not end up in horizontal position. If this is a problem, open the unit to loosen the locknut and rearrange the ball valve.

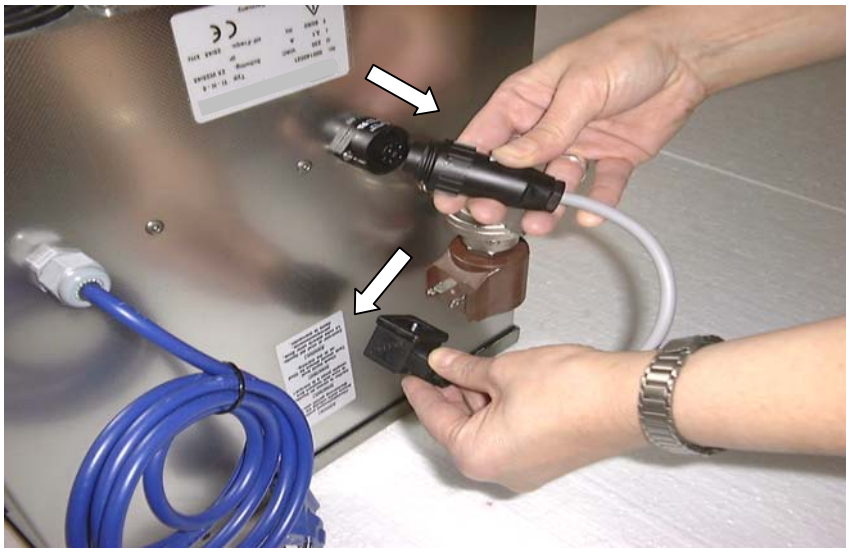


Illustration 9.1. Loosening of the electric cables

Illustration 9.2. Unscrewing of the solenoid valve (counter-clockwise)

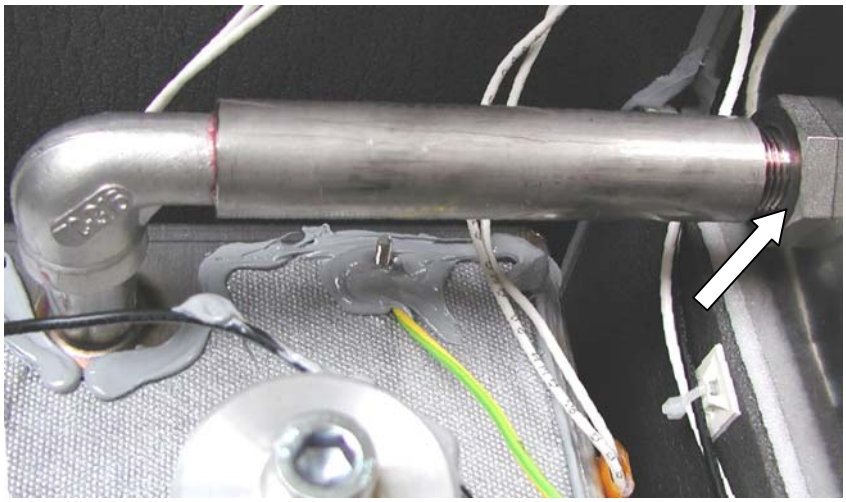


Illustration 9.3. Mounted ball valve

10 How to replace the float switch (TI-H 25 - 150)

The float switch switches off the unit as soon as the liquid level goes below the minimum. The switch operates with a delay of approx. 5 – 10 sec (hysteresis). This avoids continued switching caused e.g. by hunting of the liquid during charging and discharging of cleaning items.

A faulty float switch can cause dry running of the transducer tank after a prolonged period of unmonitored operation.

The functioning of the float switch can be checked e.g. by moving the float by hand. The switch sound of the contacter inside the unit must be audible.

Cause for break-down

Dirt particles, damage caused by aggressive cleaning media, mechanical force, etc. can impair the correct functioning of the float switch.

Order No.

100 9381 (all unit types and voltages)

How to proceed

To replace the float switch proceed as follows:

1. Unscrew the housing cover sheet (back of unit).
2. Cut both black supply cables (*see Illustration 10.1.B*).
3. Unscrew the float switch from the threaded duct.
4. Tape the new float switch with Teflon (approx. 10 wraps).
5. Screw the new float switch into the threaded duct.
6. Connect the electric connections of the new float switch with the cut cables, e.g. with crimp connections. (Polarization of the cables is not required.)
7. Put back the housing cover sheet.

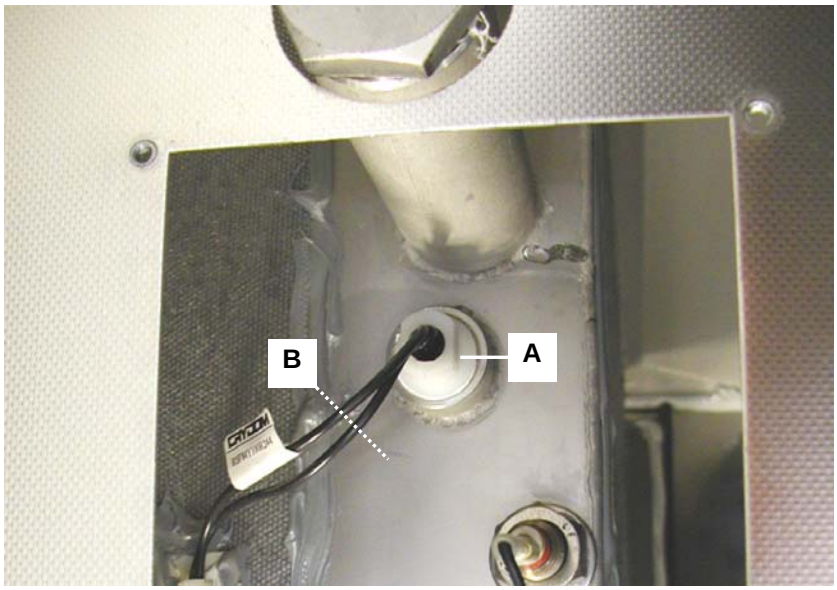


Illustration 10.1. View maintenance opening with float switch

A Float switch

B Cut electric connection here

11 How to replace the ultrasonic generator

The TI-H unit series is equipped with self-regulating generators. Adjustment of the frequencies, required on the standard generators after replacement, is not necessary on these components (pug & play component).

The replacement generator is delivered preadjusted.

Cause for break-down

There are several possible causes for a break-down of the ultrasonic generator: e.g. humidity inside, heavy variations of the voltage, extreme voltage peaks, fault in the transducer system, etc.

If the fine fuse on the printed board is faulty we recommend to replace the complete part.

Order No.

See spare parts list *Annex B*; choose according to type of unit and voltage.

How to proceed

To replace the part proceed as follows:

1. Open the unit as described in *Section 6*.
2. Mark and loosen the electric connections of the generator. Connections *see Illustration 11.1. and 11.5.*
3. Loosen the holding clips of the transistors (*see Illustration 11.3*).
4. Remove the faulty generator from the bottom plate.
5. Clip in the new generator.
6. Use new insulating bushes (included in delivery) to insulate the transistors; fix the transistors on the bottom plate.
   Caution!
   - ensure that no particles are caught between the transitors and the bottom plate / dissipator;
   - the cooling surface of the transistors must lie evenly on the bottom plate / dissipator.
7. Put the blue connection cable (*see Illustration 11.4.L*) generator >> output transformer through the phase coil (*see Illustration 11.4.M*) and connect with the generator.
   Caution! Observe the sense of coiling:
   3 wraps on TI-H 5
   2 wraps on TI-H 10 - TI-H 55
   1 wrap on TI-H 80 - TI-H 150
8. Reconnect all other cables.
   Caution! Observe the polarization of the cables.
9. Reassemble the unit and ensure that all cables are connected correctly.

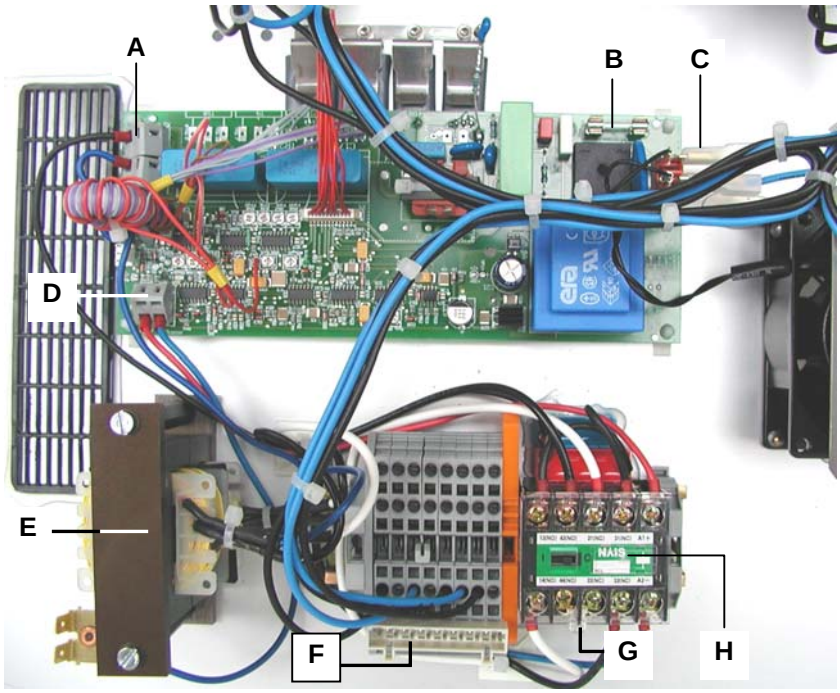


Illustration 11.1. View bottom plate (here TI-H 10)

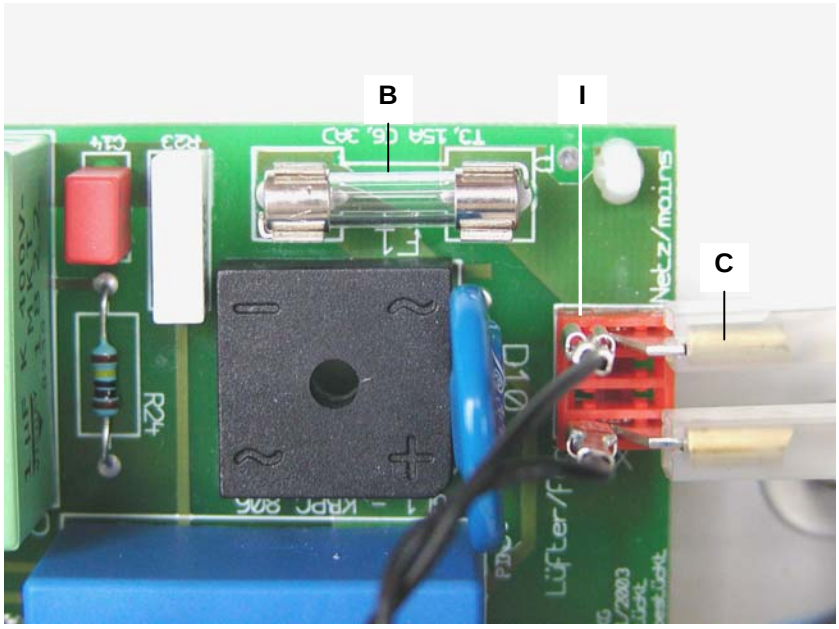


Illustration 11.2. Partial view generator (TI-H 5 – 25) with fuse.

A Output Gen_Out_2 to the output transformer

B Fine fuse

C Connection mains input generator

D Interface frequency switch-over relay

E HF output transformer

F Plug-in connection cable tree (to casing / heating)

G Plug-in connection HF output Plus

H Contactor for frequency switch-over

I Mains supply cable fan

K Screw connection transistor fastening

L Output Gen_Out_1 to output transformer (via toroidal core)

M Phase coil

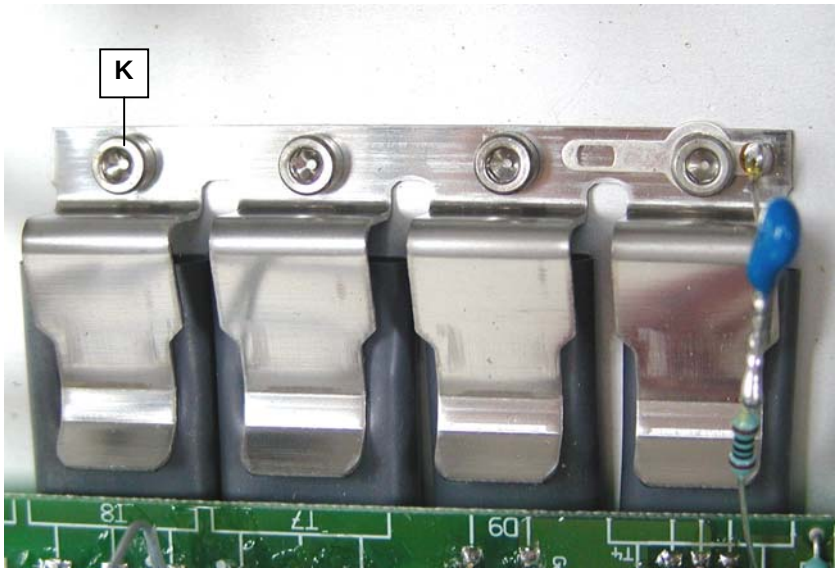


Illustration 11.3. Partial view fastening transistors / diodes output transformer

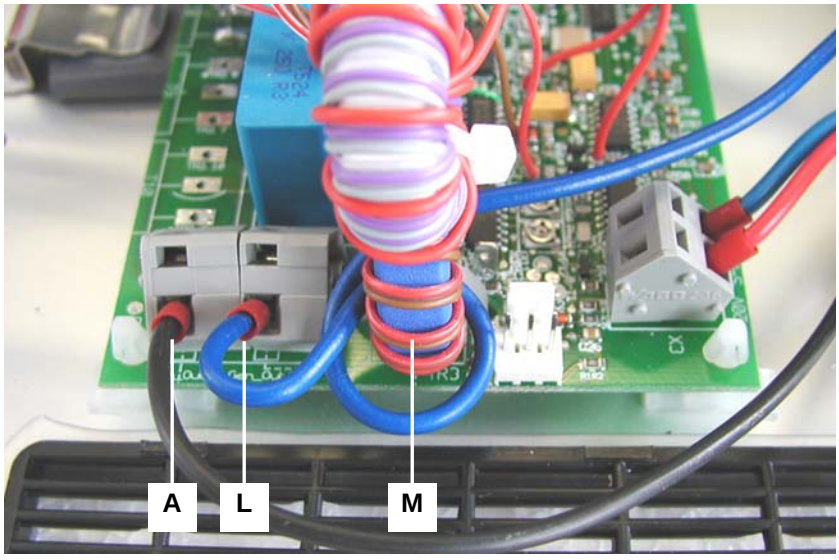


Illustration 11.4. Partial view toroidal core coil

11.1 Characteristic features on units TI-H 55 and larger

The generators in the unit types TI-H 55 – TI-H 150 differ only slightly from those in unit types TI-H 5 – 25.

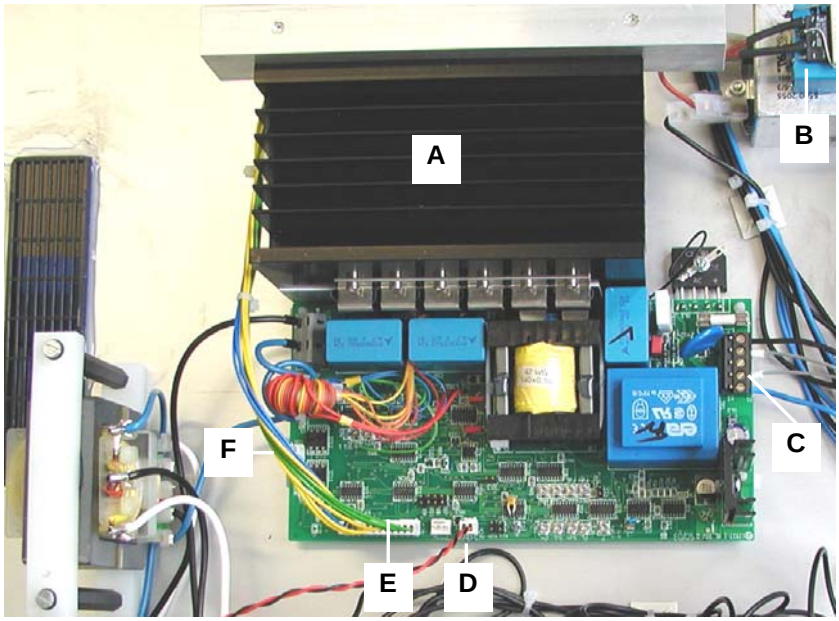


Illustration 11.5. Bottom plate with generator (here TI-H 55)

A Dissipator semi-conductor output transformer

B Overvoltage protection for generator

C Mains input binder X1: grouping 1 / 4 – mains voltage
grouping 2 / 3 – supply for fan.

D Interface X3 frequency switch-over relay

E Interface X4 operating (to operating elements)

F Interface X16 Interface

11.2 Switch elements bottom plate TI-H 55 – 150

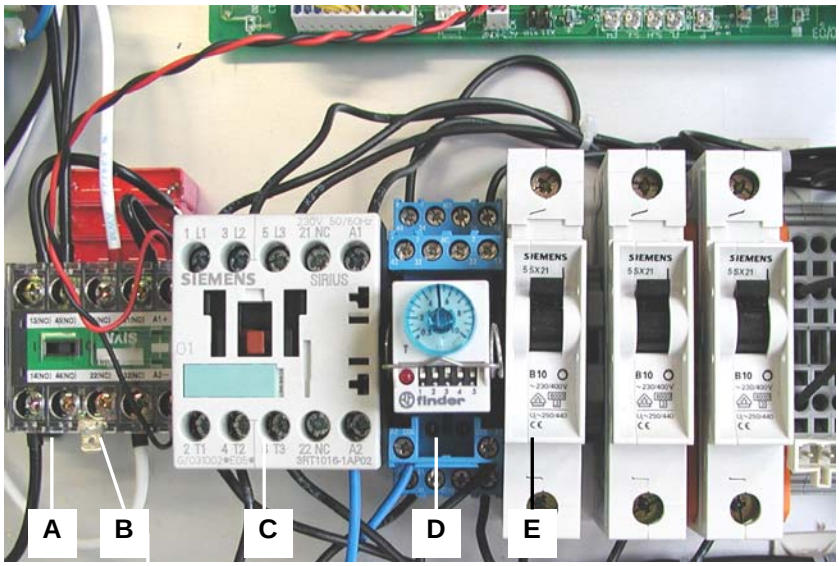


Illustration 11.6. Switch elements (TI-H 55 – TI-H 150)

A Contactor for frequency switch-over

B Plug-in connection HF output Plus

C Heating contactor

D Time lag relay for float switch (hysteresis approx. 5 sec.)

E Safety switch (3 pcs.)

A malfunction of the unit can be caused by one or more released safety switches. It is possible that the unit operates correctly as soon as the safety switch(es) are reactivated (temporary release of the component).

11.3 Characteristic features on units TI-H 115 – 150

These units are equipped with 2 generators. Both generators are controlled by the interface board.

All units made around May 2002 or later (depending on the type) have been fitted with this type of wiring.
The generator position on the bottom plate is in the area of the timer.

In case of a fault in the generator and if the unit is not fitted with an interface control, this part must be retrofitted.

Order No. 200 000 1283 (all unit types)

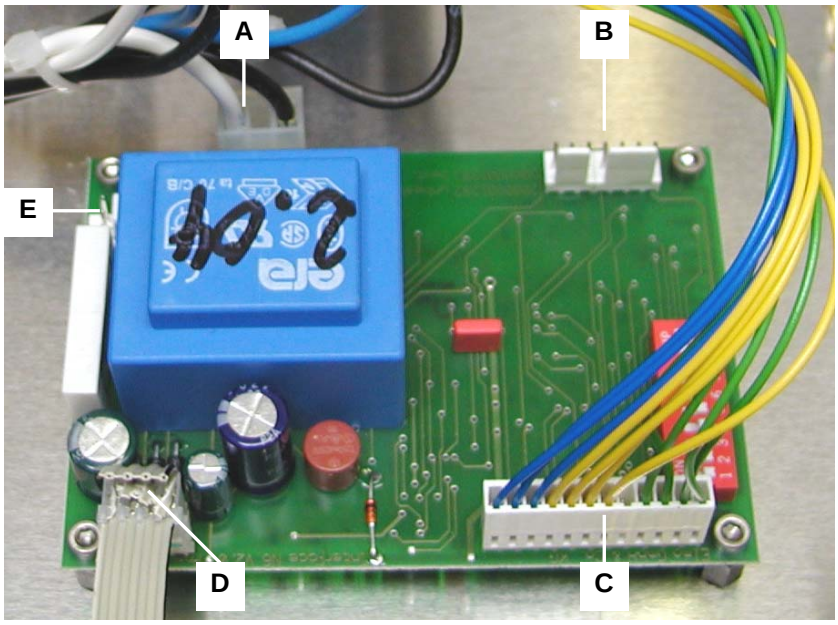


Illustration 11.7. Interface board

A Mains input

B Interface SPC control

C Connection X4: Interface operation

D Connection X16: to generator

E Output malfunction indication

12 Faulty transducer discs

The PXE transducer discs must be replaced if one or more of the discs are torn or damaged, e.g. by scorching.

To replace the transducer discs it is absolutely necessary to use a torque wrench!

The PXE transducer discs are selected capacitatively for each unit and are always mounted in a complete set. This means that all PXE transducer discs in one system must show the same electric behaviour to guarantee a homogeneous power output of the ultrasonic energy of the transducer systems. The consequence of an asymmetrical charging of the transducer systems could be a higher risk of break-down and an increased cavitational erosion on one wall of the tank.

Therefore, we strictly recommend to replace all transducer discs in case of a break-down of a single disc. The manufacturer delivers preselected sets of PXE transducer discs.

Cause for break-down

PXE transducer discs can be damaged by a number of reasons (mostly tears): e.g. by heavy cleaning items on the tank bottom, excessive bath temperatures with intensive ultrasonic operation (> 85°C).

High humidity of air or liquid inside the unit can cause scorching on and inside the transducer system.

Order No.

PXE transducer disc: 200 000 5046

Aluminum washer: 200 000 5050

Electric charge

Caution! Risk of high electric charges on PXE transducer discs!
The PXE transducer disc creates a high electric charge when opened or fastened. This can be grounded by short-circuiting from one contact to another, e.g. by means of a screw driver. Also short-circuit the plug-in connections of the electric supply cables to the transducer system.

The electric charge is also created due to temperature changes, e.g. by cooling down of a PXE transducer disc.

Do not touch charged PXE transducer discs!

How to proceed Opening

Replace the PXE transducer discs as follows:

1. Place the unit upside-down on a stable workplace and fix it on the sides (e.g. by screw clamping wood laths).
2. Open the unit as described in *Section 6*.
3. Loosen the transducer system screw(s) with the torque wrench.
   Caution! Risk of tearing off the transducer system by tilting the torque wrench.
   The torque wrench must be held vertical to the transducer system during the complete screwing process. The tie force at the handle of the tool must be exactly countered by the hand that holds and centers the tool (*see Illustration 12.1*).
4. Check each transducer disk for hair cracks and scorchings and check the insulating bushes for scorchings. If a transducer system is opened also replace the aluminum washers (F).

How to proceed Mounting

For the assembly of the new transducer system make sure that the contact surfaces are clean.
The transducer discs must be polarized correctly. Observe the markings on the PXE transducer discs (C).

1. Use a drop of Loctite or another suitable glue on the thread in the coupling piece (G) (to secure the screws).
2. Mount the individual pieces of the transducer system exactly as shown in the illustration.
3. Important! The black markings must point to the Plus contacts.
4. Screw in the transducer system screw and fasten it with the torque wrench at 58 Nm.
   CAUTION: The transducer disc creates an electric charge when fastened. Short-circuit the charge between two contacts e.g. by means of a screw driver.

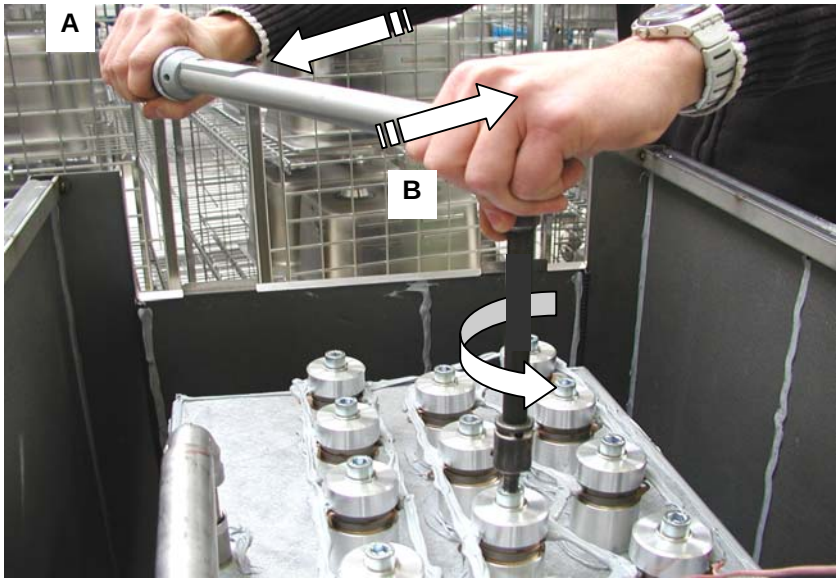
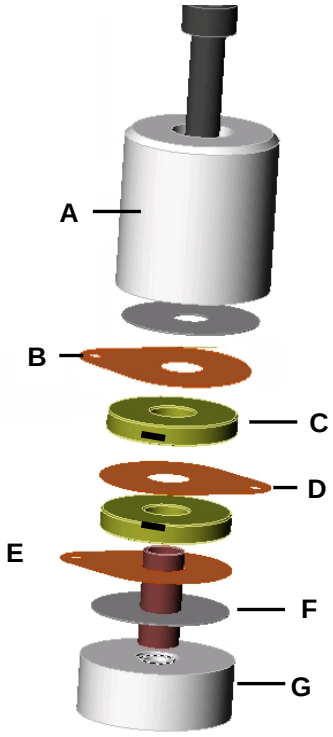


Illustration 12.1. Torque wrench must always be held exactly vertical



A Pressure piece (shape depending on frequency of the system)

B Contact Minus connection

C PXE transducer disc

D Contact Plus connection

E Contact compensating washer

F Aluminum washer

G Aluminum coupling piece

13 How to replace the transducer tank

The tank must be replaced in case of heavy damage on the tank bottom due to cavitational erosion or if it is leaking.

Order No. See spare parts list Annex B; choose according to unit type and voltage.

How to proceed To replace the transducer tank proceed as follows:

1. Place the unit upside-down on a stable workplace.
2. Open the unit as described in *Section 6*.
3. Interrupt the electric supply to the transducer tank:
   Mark all electric supply cables to the tank and loosen them. Marking the cables is important for the correct reassembly (prevention of wrong wiring).
4. Loosen the screw connections of drain and overflow.
   Note: The screw connections are sealed with Loctite 586. The screwings can be loosened more easily when the threaded section of the piping is heated with a hair dryer. Make sure that no other component in the unit is damaged in the process.
5. Separate the transducer tank from the housing:
   Carefully heat the tank edge around the silicon sealing e.g. with a hair dryer to make the silicon flexible.
6. Cut the silicon sealing with a narrow flexible knife between the tank edge and the housing.
7. Carefully lever the tank out of the unit housing.
8. Remove the silicon remains on the tank and the housing edge with a knife.
9. Use e.g. spirit to degrease the glueing surfaces on the housing and the (new) transducer tank.
10. Fill new silicon (e.g. Teroson) in the tank edge.
11. Position the unit housing in the sealing mass. Ensure correct front and back side positioning (e.g. by checking the position of the drain).
12. Let the sealing mass harden (approx. 12 h or according to the instructions of the manufacturer).
13. Mount the drain:
    Remove sealing remains from all duct threads with a wire brush and clean e.g. with spirit.
14. Seal the thread e.g. with Loctite 586.

15. Reconnect all electric cables.

Illustration 13.1. Heat up the silicon in the tank edge and cut with a knife

14 Putting into operation / Trial run

For checking and trial operation of the unit after repair please observe the instructions given in this section. We recommend a trial run over several hours (approx. 3 – 4 h) after repair.

Place the unit on a dry and stable workplace. Ensure that the workplace is sufficiently ventilated!

CAUTION

Risk of electrocution due to entering liquid!
Protect the unit against entering liquid.

The unit inside is splash-proof. To prevent electrical accidents and damage keep the workplace and the housing dry.

Ambient conditions

- Allowed ambience temperature during operation: +5°C - +40°C
- Allowed relative humidity of air during operation: 80%
- No condensation allowed

How to connect the unit to the mains

The unit must be connected to a shockproof socket only.

14.1 How to fill cleaning liquid

Observe filling level

Fill the cleaning tank of the unit with a sufficient quantity of liquid before switch-on.

NOTE

Dry running of the transducer tank can damage the unit.

Ensure that the cleaning tank is correctly filled during operation (mark on the tank wall).

Suitable cleaning media

Make sure that the selected cleaning chemical is perfectly suitable for the use in an ultrasonic bath and follow the instructions on dosage and material compatibility.

Prohibited cleaning media

In general, flammable products are not allowed. Observe the safety warnings in Section 14.2.

The safety warnings in Section 14.2 include instructions on limitations concerning cleaning media.

How to degas the liquid

Fresh cleaning liquid is saturated with air which impairs the cleaning effects of the ultrasonic activity. Sounding the liquid over a period of several minutes before the actual cleaning process is started will eliminate the microscopic air bubbles from the liquid.

14.2 Cleaning media

When choosing the cleaning chemical please ensure that it is suitable for the use in an ultrasonic bath, as wrong cleaning media can damage the transducer tank.

CAUTION

Risk of fire and explosion!

Do not use flammable liquids, e.g. solvents, directly in the ultrasonic cleaning tank.

Ultrasonic activity increases the vapourization of liquids and creates fine vapours which can ignite on any ignition source.

NOTE

Risk of damage to the transducer tank!

Do not use acid cleaners directly in the stainless-steel tank (pH value below 7), when at the same time halogenides (fluorides, chlorides or bromides) will be removed from the cleaning media or the cleaning liquid.
The same applies for solvents containing NaCl.

The stainless-steel tank can be damaged by crevice corrosion within a short period. These substances can be contained in household cleaners.

If in doubt please contact your distributor or the manufacturer.

14.3 How to heat up the cleaning liquid

Depending on the kind of contamination and on the used cleaning chemical we recommend to heat up the cleaning liquid.

Turn the “heating” switch to position “on“

Activate the heating switch. The yellow signal lamp “heating” turns on.

Temperature control at thermostate

Choose the required cleaning temperature. The tank must be filled half (minimum). The optimum filling level is marked on the tank wall.

In order to achieve an even heating of the cleaning liquid switch on the ultrasound from time to time or stir the liquid by hand.

15 Putting out of operation and disposal

The components can be given to electronic and metal recycling stations or returned to the manufacturer for the same purpose.